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ABSTRACT

Usually the impact of technology is felt first in terms of the devices we use; then in terms of people and man-machine relationships. The next impact tends to be on the support systems and procedures associated with the man-machine relationships; and lastly the related goals and values of the total effort tend to change. The impact of technology on librarians and libraries has thus been first on devices and media, then on the role of the librarian, and lastly on the concept of a library. An example of the latter is the systematic attempt to apply information science in networking systems that are user oriented. The impact of information overload, changes in formats in which information is stored, changes in man-machine relationships, more emphasis on cost effectiveness, changes in patterns of education organization, individualization of instruction, and changes in goals and roles of librarians can all be seen as the result of a developing technology which forces the re-examination of the goals and values of the library for the future (Author/JY)

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EDUCATIONAL TECHNOLOGY - A CHALLENGE FOR LIBRARIANS

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Educational Technology - A Challenge for Librarians

In a very general sense, this paper might be called Middletown Revisited. Major changes have taken place since the days of Middletown in our lives, in our society, and in the realities with which all of us must deal. It was here in Muncie, Indiana, in 1925, that Robert and Helen Lynd completed the field work for their pioneer study "in the manner of social anthropology," using Muncie as a typical case example. When the Lynds returned to Muncie ten years later, in the mid-1930s, after the community had experienced an unprecendented boom and then the bust, they noted "an impression of external improvement and sprucing up at a number of points." Schools had been refurbished, a boulevard ran beside the river, and a park and swimming pool had replaced the dump in the center of town. They thought at first that these were the fruits of the boom years, but it turned out that they were WPA projects undertaken after the bust in 1929.

Why hadn't they been done earlier in the boom period? The Lynds knew that these were "things people talked about and editors wrote about as old, familiar local problems ten years earlier." The investigators suggested that there were some reasons why this work had remained undone:

1. A tradition of approaching and stating problems negatively rather than positively, which made "economy" the watchword of local government.
2. This tradition emphasized the known and avoided the unknown. Middletowners distrusted planners, "intellectuals," and "all men who let their thoughts and imaginations run beyond immediacies. Big steps in a world devoted to gradualness are suspect."

3. Middletowners showed a pervasive pride in "how far we've come," which made the present look good as compared with the past. Thus, "an epidemic of only 75 cases of scarlet fever looks good as compared with the 300 in the old days." In "the absence of prospective standards," this "fallicy of movement" lulled local criticism and stifled action.

The Lynds concluded that "in a culture so patterned, the likelihood of the emergence of forthright civic social change ... is curtailed almost to the vanishing point." What did bring change about in the 1930s in terms of civic improvements, was the agency of the federal government. Suddenly, with the New Deal, "the city began to move in a non-Euclidian world in which the old civic axioms were suspended and the city was asked to state its civic desires positively -- to frame a new series of objectives -- and to go ahead and act on them. Having no alternative, the city began to play the new game."

These introductory remarks are drawn largely from a brilliant latter-day review of the two old Lynd books by Donald Carity in the January 29, 1972, issue of The New Republic. It seems to me that there is a lesson for us here today when I am revisiting Middletown - a lesson that related to our present educational dilemma. Do we really understand the role of, and the need for, outside planning and leadership to release and facilitate local change? Are we still approaching our problems negatively rather than positively? Are we willing -- in our own sphere of education -- to state our goals clearly in terms of measurable objectives? Are we hung-up on a tradition in our schools and libraries? Are we satisfied with averages rather than with a concern for each person as an individual? And, are we in education still looking back at how far we've come? I am tempted at this point to consider just how far we have come in education since I taught junior high school science here in Muncie thirty years ago, but I shall resist that temptation.

My assignment for today indicates that I may speak on any aspect of the general topic "instructional systems technology." I have taken some liberty with this. First, I have chosen to enlarge the scope of my remarks from the area of instructional technology to the much broader area of educational technology because this will give me more latitude. It will also make possible a more logical and a closer relationship between our topic today and the major social, political and economic problems facing our nation today. Understanding this relationship -- between our "library-media-technology" concerns and our national problems -- is without any question the only way we are going to introduce into our education institutions the magnitude of change that will make any difference at all.

Another reason for enlarging the scope of my remarks is that libraries are concerned not only with instruction but with education in the broader sense. Also, it seems to me that educational technology is further developed today than is instructional technology, which to my way of thinking, scarcely exists at all at the present time! I have also eliminated the word "systems" for the reason that my definition of educational technology - and for that matter <u>any</u> definition of technology - will include the concept of systems. I shall elaborate on this later.

<u>Definition of Technology</u>

The word "technology" is derived from the Greek word "technologia" which means "systematic treatment," that is, the process of analyzing a human task and devising a system of materials, personnel and procedures to accomplish it. Now, when the word "technology" is modified by such terms as "instruction" and "education" - and when all of this is related to the idea of a library - we have established some almost global parameters for our discussion. Looking back over the years of our interminable efforts

to relate libraries and media, I have concluded that we were too often limited by a "micro" rather than a "macro" view of education and our relation to this larger view. We were "Middletowners" during the boom years.

Hoban, in 1962, was one of the first to clearly differentiate between media and technology. He said, "technology is not just machines and men, it is a complex, integrated organization of men and machines, of ideas, of procedures, and of management." The U.S. Commission on Instructional Technology in its 1970 report further defined instructional technology as "a systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and non-human resources to bring about more effective instruction."

Media, on the other hand, are a subset of educational technology referring to those materials and devices which mediate between the user and the real event. They lack the systematic integration that is the hallmark of technology. They are simply tools.

In military and industrial circles, technological systems may be fully developed, pretested and revised before adoption. This is not the practice in educational circles, at least not at the present time; technological systems in education develop on a piecemeal basis, and usually without central direction or control.

Developmental Sequence

Usually the impact of technology is felt first in terms of the devices we use, that is, the hardware and software; then in terms of people and man-machine relationships. The next impact tends to be on processes, that is, the support systems and procedures associated with the man-machine relationships and lastly - largely as a result of the devices and processes - the related goals and values of the total effort tend to change.

As a technology develops within a society, it produces confusion over means and ends, processes and purposes. Goals and values change. Old laws become burdensome or useless, and must be changed - and change is difficult. New goals become visible as well as possible. And new dimensions of human dignity come within our grasp. What I am saying is that the proper study of technology is the study of man - man as an individual, and man as a society.

At any given time, one phase of technological development may be fairly well advanced while another is very crude. For example, libraries are much more advanced in the incorporation of new media into their collections than they were in devising procedures to make the new library concept function adequately. This is to say that there is a lag between the development of new procedures for classification, cataloging shelving and circulation and the more fundamental need of making necessary changes in the purpose of the library .

A couple of examples of the development of a technology may be useful. We might take the invention of the automobile, a device, which gradually came to look less like the buggy which it was later to replace. The automobile was followed by changes in human behavior, in what people do and how and where they do it. The auto gave rise to suburbia, the commuter, new jobs and even to international tensions. Gradually, new processes and techniques were invented - the nationwide road system, the supporting gasoline and garage systems, and now pollution control effects, streets for people only, and special highway lanes reserved for buses. The logic of the two and three car family is now beginning to be questioned. To put it another way, the original goals of transportation related to the first cars are now being questioned.

In a similar developmental vain, clay tablets, scrolls and then books developed before the mass of the people were influenced by them, and before orderly systems for processing their collection had been invented, e.g., the Dewey Decimal System; before

library shelving and card catalogs were invented; before schools of library education were established and before the goal was established of having a library in every school and in every community. But, now that all these interrelated things exist, one can say that a technology of librarianship exists, at least for printed collections and, of course, the Dewey Decimal System is as much a part of the technology as is the web press and the librarian. We have perhaps again reached the point where some of our original goals are being challenged. Incidentally, I understand that serious questions are being raised in some quarters about a duplication of effort between school and public libraries.

Devices. Let us look for a moment at how this developmental sequence of technology has affected teachers and media specialists.

As more and more of the new "things" of instruction become available in the schools, we accepted the fact that a function of media was "to supplement the teacher through enhancing his effectiveness in the classroom. Educational media are both tools for teaching and avenues for learning and their function is to serve these two processes by enhancing clarity in communication, diversity in method and forcefulness in appeal." (4) An illustration of this function would be the librarian's use of a film or filmstrip to teach the use of the card catalog. Note that the media are used for presentational purposes and used by the librarian as an additional tool, an extension of a human. Another example of this "things" level of technological development would be the combining of the book library with the audiovisual center, that is, placing them within the same physical area of the school and renaming the new entity the media center or, God forbid, the educational technology center.

Men. Eventually, the use of the hardware and software tools begins to change human behavior and the relationship of people to things. For example, the librarian may decide to put the visit to the library or the demonstration on how to use the card

catalog on videotape so that it can be used time and time again via closed circuit television on student demand. Now, the librarian is determining the objective, selecting the method and content, and evaluating the final learning outcome, but media have substituted for a previous activity of the librarian. In other words, he is a "teacher on media" or, to use Heinich's terms, a "mediated teacher." This function of media may be said "to enhance overall productivity through instructional media and systems which do not depend upon the teacher for routine execution of many instructional processes or for clerical, mechanical chores." (4) If we apply this developmental level concept to our earlier media center illustration, we would find that it had moved from sharing joint facilities to an integrated collection and service program based on a systematic achievement of specified objectives. It is self-evident that this level of development requires retraining of staff for new roles and the introduction of new jobs such as the library retraining of staff for new roles and the introduction of new jobs such as the library technician, the audio-visual technician, the production specialist and the like.

As we get more comfortable with the concept of mediated instruction, we begin to explore new uses of media beyond that of presentation and we find that media can take over many functions such as: storage and retrieval of information, self-analysis, distribution of information and data, interaction and self-instruction.

Processes. Changes in the role of people and media bring pressures for change in the processes and procedures connected with their relationship. An example is the rise of the media support system for the teacher which provides for projectionist service, material and equipment delivery, equipment repair, production of materials and changes in the cataloging rules and procedures.

As soon as we make the decision that the library will not only acquire and store media of all types but that it will fully integrate the book and non-book materials, we have opened up a tremendous number of questions and problems in the process and procedures area. This is the stage of technology where most of the libraries and media centers are operating today. Some examples of "process" problems with which we are struggling are: the lack of multimedia library procedures; poor documentation of the newer media; difficulties of handling and maintaining media of different physical formats; the cost of materials and equipment; lack of standardization of terminology; copyright, circulation and use problems; lack of space for storage and handling the new media; lack of workable cataloging rules; how to provide for remote, electronic browsing; and the growing problem of professional preparation.

Goals and Values. As we begin to change the functioning of the library, we begin to affect goals and values. For all practical purposes, you librarians have been saying in the past (a la Henry Ford): "We will provide any information that you want as long as you come to us to get it, as long as you can read, and as long as someone else hasn't already got it!" Libraries and media centers are being forced to do more to meet the needs of individuals, to accommodate their learning styles, and to provide equal access for all groups including minorities, the poor and those in remote areas.

The emergence, in its own right, of non-book media is having an effect on the curriculum. As a British colleague has observed:

> The "book" has profoundly influenced education ever since printing was invented, and those subjects which are most easily propagated by books have tended to prosper. The new media service other subjects which have a high "experience" quality such as drama, music, art, and craft, bringing the best experience to everyone with the kind of immediacy which some people gain from a book. This may very well produce a new evaluation of the several disciplines within the curriculum and an alteration of the balance between them. Something of this has already occurred in adult life.

> Not only do those subjects that can be taught best by book methods prosper, but the goals of instruction have been influenced by, and have depended upon, the book as the primary medium of education. However, as new teaching materials become available, educational goals and methodology change. An example is foreign language teaching. When the book was the sole teaching material, the objectives were to read and write the language. With the introduction of discs and tapes and language laboratories, a major emphasis was placed on speaking the language.

This quote reminds me of my early life here in rural Indiana when the spelling bee had already passed its prime as a social and intellectual event of some importance. Fortunately, the spelling bee and other rigid, rote forms of "book lernin" have outlived their rude attempts to reflect simplistic goals of education. The idea that an education is simply a matter of learning what is to be found in books was dealt with by Edgar Lee Masters in his Spoon River Anthology where Frank Drummer speaks from his grave:

> My tongue could not speak what stirred within me,
> And the village thought me a fool.
> Yet at the start there was a clear vision,
> A high and urgent purpose in my soul
> Which drove me on trying to memorize
> The Encyclopedia Britannica!

Levels of Sophistication. As was previously stated, a technological system tends to evolve on a piecemeal basis rather than to spring full blown from Minerva's head. Changes can occur in devices, people, and processes independently, that is, without being systematically interrelated. This is the present state of technology or pre-technology in education and in librarianship. This state has been referred to by Snider as "Level One" technology which, he says,

> is characterized by the "audiovisual aid" or "product" definition of educational technology whereby the major end is to provide materials and services to classroom teachers on demand. At this level, the curriculum and the teaching functions are enriched and supplemented by an array of media and machines that are nearly always under the control of the teacher. Here success is most frequently measured numerically in terms of student and teacher use of such resources. New developments such as computer-assisted instruction and cable television are used at this level provided that they do not significantly interrupt established class organization, scheduling, and gradedness. In action, Level One is characterized by order and neatness. (6)

The problems we are facing are tremendous even at this Level One or "product" definition of technology. At this level, I would define the role of the library to be to collect, store, organize and dispense recorded information and ideas. If one were to broaden the role of the library to include all the functions formerly provided by the library and audiovisual center, then the problem is even further complicated. This is probably why some individuals such as S. G. Prentiss are advocating only the first step, that is, incorporating the recorded materials in the library but not attempting to embrace the other media support function. Let me clarify by quoting from an abstract of his paper, "Libraries in a Changing Society,"

> The production and broadcast of a television program, for example, is a communication function but it is not a library function. Should the same television program be recorded and stored, however, it will have immediately gained a new dimension because in its recorded form it can be reused at will. The library function is performed when an aggregation of such materials is stored in a systematic way. (1)

Gradually, the pieces (products, people and processes) begin to be seen and treated as interrelated parts of a whole. Snider has called this more advanced level of technology, "Level Two" and he describes it as being:

> characterized by a systematic or "process" approach to educational technology that is usually based on clearly stated learning objectives. Its major end is to maximize individual attainment for learners. At this level, resources are considered to be a viable mix of men, media, and machines that can hopefully be adjusted to individual learning. Here success is measured in terms

> of learning output usually assessed on an individual basis. Newer developments such as computer-assisted instruction are often the basis for abolishing -- sometimes on an experimental basis -- class organization, group scheduling, and gradedness. The Level Two approach tends to force a consideration of basis questions about curriculum, staff functions and instructional objectives. In action, it does not look very neat. (6)

In Level Two technology, the pieces that are dealt with independently at Level One are interrelated in a systematic way using standard problem-solving techniques. This systems approach consists of (1) identifying the needs, (2) setting up measurable objectives, (3) considering constraints and alternative solutions, (4) selecting from among the alternatives, (5) implementation of the chosen solution, (6) evaluation of results against the stated objectives, and (7) modification of the system to correct deficiencies. Only the beginnings of Level Two technology can be seen in schools and libraries but it may be useful to explore these beginnings.

We have illustrations of instructional systems in IPI, Individually Prescribed Instruction, Project PLAN, the Postelwaite Botany course and the Open University courses in England. They involve a "scientifically developed combination of instructors, materials and technological media for obtaining optimum learning with a minimum of routine personal involvement by the teacher. The result is a carefully planned system consisting of subject matter, procedures and media coordinated in a program unit design which is directed toward specific behavioral objectives." (4) The support role of the teacher and the librarian are quite different in Level Two technology than they are in Level One, and other human functions are required.

Librarians, too, are experimenting with technology at Level Two, for example, in attempts to apply information science and in experiments with networking systems. The networking systems are focusing on more efficient and economical ways of handling the

rapidly expanding volume of recorded knowledge and, on the other hand, with the problem of decentralizing library services by taking the information to the user and thereby increasing the access to the library resources.

Louis Vagianos, writing in the January 72 Library Journal, seems to be directing his criticism to Level Two technology when he states that "information scientists have not understood the nature of their problem...and lack the meaningful direction of realistic goals". (7) Technology that is "process oriented" requires of us new patterns of thinking and operating, staff training for new roles, a different phrasing of research questions and above all definitive goal setting. In other words, it must be based on system-wide changes that extend far beyond the library.

To illustrate, let me again quote S. G. Prentiss. He says that an area where research would be productive is "the adaptation of modern electronic and photographic technology to library purposes, especially in such areas as the use of libraries which are physically removed from the user." (1) But what are the library purposes? To me this quote illustrates a research question that would be more appropriate for Level One technology than for Level Two. Level Two would not be concerned with adapting the technology to the library but rather in adapting the library through technological means so as to increase its usefulness. This difference of focus, in my opinion, is quite important for us to grasp. It goes back to the "means-ends" confusion that is typically associated with technology.

Future Trends and Their Implications. As I have attempted to point out, in library and educational circles we are currently operating at a "product," Level One

technology. We are, however, moving toward a "process," Level Two technology. Both levels will continue to exist for many years, hopefully with an increasing degree of compatibility. The move from Level One to Level Two generates a great deal of stress or what some writers are now referring to as "future shock." It does not seem possible to avoid the malady; the best one can do is to prepare for it and thereby reduce shock through understanding. In other words, we must have a clear picture in our minds of where we are, and where are want to go.

What are some of these areas that require understanding and treatment if "future shock" among librarians is to be avoided? Here are some that occur to me.

1. <u>The information overload</u>.

This condition is due partly to the information explosion and partly to our inability to distinguish between useful and non-useful information. Note that I say "information explosion" rather than "knowledge explosion." As far as I am concerned, there is no knowledge explosion. There may be a need, however, for some kind of a new contraceptive that will limit the output of printing presses - and videotape cameras! When Thurber Hall was dedicated at the Ohio State University some years ago, the OSU Photo Department wrote James Thurber to inquire if they might make a sound motion picture of the event - including his speech. Thurber wrote back: "No. You may not take a motion picture of me reading my remarks on your campus. You already have a copy of my speech. Your library has all of my books. There is nothing more. We are suffering from over-communication."

2. Changes in the formats in which information is stored.

We are only beginning to feel the effects of multimedia formats for the storage and dissemination of information. To date, libraries have been largely able to sidestep the issue because most information available in so-called "non-book" formats has also been available in printed form.

3. A change in man-machine relationships.

Men and machines can no longer be viewed as protagonists but must operate within a system playing related but distinctive roles toward the achievement of objectives.

4. More emphasis on cost effectiveness.

Technology has embodied in it the concepts of tradeoffs and reallocation of resources and evaluation. Society now takes a highly pragmatic attitude toward institutions. If adequate library services cannot efficiently be delivered to the potential users, these services and/or the libraries will be sluffed off as institutions that have outlived their time. There is a growing literature on "ALTERNATIVES" for both the school and the library.

5. Changing patterns of educational organization.

The library of the future will need to serve not only those individuals engaged in formal education as we know it today but also those who are being educated through many alternatives to formal schooling and those engaged in continuing education.

6. Individualization of instruction.

Although related to self-instruction and independent study, it should not be confused with either. It means the serving of the needs of each individual as opposed to catering to the group. It provides for the humanization of education through options about what is learned and when and where and how it is learned.

7. Goals.

Technology is making it increasingly impossible for institutions and professional associations to operate without taking value stands -- as they have in the past, and as they did during Middletown's boom. Of course, many of these institutions have assumed value positions by default -- as they have in relation to blacks, the poor, and other minorities. Today, however, educational technology has about reached the point where it will make possible, and thus ultimately force, new goals for education, goals that have been neither possible nor practical before, such as the development of each person to his fullest potential as a unique human being.

Role Change. It has been said that librarians and teachers are conservative by nature; that they resist change. I doubt that they are more resistant to change than other members of society. Most of the people in the world, it seems to me, are willing to accept a revolutionary process of development for others but only an evolutionary process for themselves! There are some steps, however, that can be taken to facilitate role change among librarians.

1. We can provide future librarians with a working knowledge of technology including man-machine relationships, the scientific method of problem-solving and particularly technology as applied to librarianship and to education.

2. We can acquaint future librarians with the wide range of media formats and with instructional systems composed of one or more media - their characteristics, evaluation, selection, processing, handling and use.

3. We can instill in the future librarian attitudes which will support new roles rather than apprehension of them. We can instill a value-oriented stance.

4. We can train a librarian who will be skilled in team operation within an institutional setting.

5. We can prepare a librarian for the future who will have at his command techniques useful in the individualization of instruction.

6. We can prepare more specialists and fewer generalists, for the future seems to lie with specialization.

The Future. Recently, a document from Sweden entitled Report on a Delphi Study - Information, Documentation and Media reached my desk. (5) This study forecasts the outlook for the 70s, the 80s and the 90s. For the 70s, the study predicts that the capacity of information and documentation libraries will increase and new functions will be added to a limited extent. Printed material will still be the predominant medium for dissemination and storage of information. The functions of libraries will remain essentially unchanged, they say, but the share of libraries of the total amount of information will decrease because of a heavy expansion of other types of information systems.

The forecast for the 1980s runs something as follows. Several new functions will be developed within the I&D systems and the systems will be interconnected to a limited extent. Libraries will undertake the marketing of processed information adapted to the user's needs. Although printed materials will predominate for storage of information, new techniques will make considerable advance. For example, they predict that in the 80s that scientific journals will be replaced by computer stored material. Only a small part of the total mass of information will be transferred via paper.

By 1990, the study predicts that the I&D systems will attain a high degree of specialization and have far-reaching interconnections between information systems. The transfer and storage of information will be largely by electronic means. The average individual will face a greater range of alternatives when consuming information. Let me quote one paragraph:

> Towards the end of this century the average individual will communicate several times a day with various sources of information by the use of data terminals. He will also use the videophone as often as he uses the ordinary telephone today. Further information on civic rights and duties will be communicated to him automatically and selectively (i.e., on the basis of stated profiles of interest). The submission of applications and statements of various kinds will be reduced as will paperbound communication in general. Far-reaching decentralization of higher education and adjustment to individual needs will become feasible through communication with educational data banks via extensive terminal networks. Proper use of these new facilities for information and communication will require changes in the contents of education on many levels. (5)

If these predictions from the Swedish government prove true for the United States as well, then we have only ten or fifteen years to master and manage the technological forces - assuming, of course, that this is the direction society needs and wants to go.

There is one advantage of being a "near-senior citizen," and that is that one can freely point out the problems ten to twenty years ahead without having to face up to how we get to there from here. I can only hope that somewhere, perhaps in this audience, is a supermind that can build a bridge. For we must not lose sight of one simple fact: today's graduate will be the mid-career, senior librarians of the year 2000.

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